Improved fibre reinforced film and method for the manufacturing thereof.

The present invention concerns an improved fibre reinforced film.

Glass fibre reinforced films which are composed of a layer of glass fibres provided on either side with a layer of polyethylene, polypropylene or any other thermoplastic whatsoever are generally known.

The problem which arises is that such glass fibre reinforced films are less appropriate for thermal recycling.

The melting point of the glass fibres is situated under the usual temperature of a recycling oven, which has for a result that the glass fibres will melt during the thermal recycling and will adhere to the oven wall.

Moreover, it is known that glass fibres contain many harmful additives which can be released during the thermal recycling.

The present invention aims to remedy the above-mentioned and other disadvantages.

To this end, the invention concerns a fibre reinforced film which is composed of a basalt fibre layer which is provided at least on one side with a layer of

thermoplastic material.

A major advantage is that basalt is a natural product which can be processed into appropriate fibres without any additives.

Moreover, basalt has a melting point which is higher than the operational temperature of a common recycling oven, such that, as opposed to for example glass fibres, the basalt fibres will not melt and adhere to the wall of the recycling oven in a harmful manner.

Consequently, basalt fibre reinforced films offer an appropriate answer to the need to use materials which can be recycled.

The recycleability and the absence of harmful additives is very important, since such films are often applied in the interiors of passenger cars or lorries.

Moreover, compared to glass fibre reinforced films, basalt fibre reinforced films with a comparable bending stiffness are about 30% less heavy.

The invention also concerns a method for manufacturing such basalt fibre reinforced films according to the invention.

This method consists in supplying a basalt fibre layer and in providing a layer of thermoplastic material on at least one side of the basalt fibre layer, after which the layer of thermoplastic material is pressed on

and cooled.

In order to better explain the characteristics of the invention, the following preferred embodiment of a basalt fibre reinforced film on the one hand and of a device with which the method according to the invention for manufacturing a basalt fibre reinforced film can be applied on the other hand, is given as an example only without being limitative in any way, with reference to the accompanying drawings, in which:

figures 1 to 5 are sections representing different embodiments of an improved fibre reinforced film according to the invention;
figure 6 schematically represents a device which makes it possible to realise the method according to the invention.

Figure 1 represents a very simple embodiment of a fibre reinforced film 1 according to the invention which mainly consists of a basalt fibre layer 2 onto which is provided, on one side, a layer of thermoplastic material 3, for example a layer of polyethylene or polypropylene.

The basalt fibre layer 2 in this embodiment consists of loose basalt fibres and is penetrated to a great extent by the thermoplastic material.

The basalt fibres have for example a length of 8 to 10 mm and they have a sectional diameter of some 18

micrometer.

In figure 2, however, the layer 2 of basalt fibres is formed of a mat 4.

In this embodiment, the basalt fibre layer 2 is provided on both sides with a layer of thermoplastic material 3, in this case made for example of polyethylene.

The basalt fibre layer 2 is penetrated by the thermoplastic material and both layers of thermoplastic material 3 adhere through the openings between the basalt fibres, such that together they form a matrix surrounding the basalt fibres.

Such a film 1 is for example particularly appropriate for use in interior applications of passenger cars and lorries. Such a film 1 is best applied on a support which can be formed in a suitable manner together with the applied film.

Figure 3 represents a basalt fibre reinforced film 1 which consists of a basalt fibre layer 2 provided on either side with a layer of thermoplastic material 3, but in which perforations 5 have moreover been provided.

Such perforations 5 are particularly suitable to improve the sound-insulating qualities, which is particularly important for the application in vehicle interiors.

Figure 4 represents a variant of the embodiment of a fibre reinforced film 1 according to the invention, whereby a basalt fibre layer 2 is provided on either side with a layer of thermoplastic material 3, as in the embodiment represented in figure 2, and whereby moreover a membrane 6 or protective layer is provided, and whereby a bonding layer 7 is provided on the other side of the film.

The membrane 6 forms a protection and/or decorative finish of the film 1, whereas the bonding layer 7 is suitable for fixing the film 1 to a support.

The membrane 6 may for example consist of polyester, polyester viscose, polyester cellulose or paper or the like.

The bonding layer 7 consists for example of ethylene vinyl acetate, ethylene acrylic acid, a co-polyester or a co-polyamide or the like.

Figure 5 represents a special embodiment of a fibre reinforced film 1 according to the invention which is more particularly formed of a basalt fibre layer 2, which is made here as a fabric on one side of which has been provided a layer of thermoplastic material 3, for example a layer of polyethylene.

On top of this layer of polyethylene is provided a first bonding layer 8 which is made for example of modified

polyethylene, and on top of the latter has been provided a barrier layer 9, for example made of polyamide.

On top of the barrier layer 9 is provided a second bonding layer 10 made of polyethylene which is finally covered with a membrane 6 or cover layer made of for example modified polyester.

The barrier layer 9 can be applied to prevent the binding material from going through the film 1 during the process and/or in order to keep the back of the film 1 closed for acoustic reasons when the film 1 is applied for example in car tops.

Figure 6 schematically represents a device which makes it possible to realise the method according to the invention.

The device as represented is based on a spool 11 onto which is provided a prefabricated basalt fibre mat 4.

Such a basalt fibre mat 4 can for example be made by solving basalt fibres in water and by providing this solution on a conveyor belt which is provided with an underpressure at the bottom, such that the water is drawn out of it, and whereby, during the drying process, a binder is added, such that a paperlike layer is obtained.

Naturally, such a mat 4 can also be obtained in other ways, for example by mutually braiding the fibre threads, such that a fabric is obtained.

Downstream the device, as represented in figure 6, is provided a first extrusion device 12 which provides a layer of thermoplastic material 3 on the basalt fibre mat 4, for example polyethylene, and also a spool 13 onto which is wound a polyester membrane 6 which is provided on top of the layer of thermoplastic material 3.

The whole is guided between a rubber pressure roller 14 and a metal cooling roller 15, such that the basalt fibre mat 4 is largely penetrated by the polyethylene, and such that, simultaneously, the polyester membrane 6 is laminated on the layer of thermoplastic material 3.

The semi-finished film is subsequently turned around by means of return pulleys 16 and carried with the non-processed side up to a second, in this case double-working extrusion device 17, and provided there with a layer of thermoplastic material 3 and a bonding layer 7, according to what is called the co-extrusion technique.

The semi-finished film is guided in a similar manner as in the case of the first extrusion device 12 between a rubber pressure roller 13 and a metal cooling roller 15.

As a final processing, the thus obtained basalt fibre reinforced film 1 is guided along a perforation cylinder 18 to be finally rolled up on a spool 19.

It is clear that this device merely illustrates the

method which consists, in the most simple embodiment, in supplying a basalt fibre layer 2 and in providing at least on one side of the basalt fibre layer 2 a layer of thermoplastic material 3, after which the layer of thermoplastic material 3 is pressed on and cooled.

The above-described device also makes it possible to subsequently also provide a second layer of thermoplastic material 3, on the other side of the basalt fibre layer 2, and to press this layer 3 at least partly in the basalt fibre layer 2 and cool it.

The device also makes it possible to provide a membrane 6, together with a layer of thermoplastic material 3 which is being provided, by means of co-lamination, or to simultaneously provide a bonding layer 7 by means of co-extrusion.

It is clear that the layers of thermoplastic material 3 can also be coloured by simply adding colouring agents to the basic material of the basic material to be extruded.

The present invention is by no means limited to the above-described basalt fibre reinforced films and the described method for manufacturing such films; on the contrary, such films according to the invention can be made according to different variants while still remaining within the scope of the invention.